REMARKS

In accordance with the foregoing, no claims have been amended, cancelled, or added. No new matter has been entered. Therefore, claims 2-4, 8-17, 29-40 are pending and reconsideration is respectfully requested.

RESPONSE TO THE "RESPONSE TO ARGUMENTS" SECTION OF THE OFFICE ACTION:

In the "Response to Arguments" section of the Office Action, the Examiner states that the claims remain rejected under 35 U.S.C. 112, first paragraph. According to the Examiner, the evidence illustrates that it is possible to measure the viscosity of the solvent in centipoises (cP's), but that "this is one of the common ways to label viscosity," and that "it is not the only way." The Examiner then suggests that viscosity can be measured in units of "poise, centipoises, Pa, etc," and that "the units needed to be present in the specification and the claims when the application was filed. Again, applicants express their disagreement with these conclusions.

As to the suggestion that cP's were "not the only way" to measure the viscosity of the claimed solvents, applicants note that, in fact, cP's are the only unit of measurement that agrees with the record, as one would expect. This is due to the fact that a selection of solvents and the value of the viscosity are available in the specification. As such, the only unit of measurement that fits is the cP.

For example, from the specification, it is known that the solvent in question could have been any one of several solvents such as methyl acetate, methyl proprionate, diethyl carbonate, etc. It is further known, from the evidentiary table provided with the January 18, 2005 Response that these solvents have viscosities of .37 cP, .43 cP, and .75 cP, respectively, each of which is well within the claimed range of viscosity (i.e., that the viscosity be less than 1.3 *cP*). Moreover, the solvents listed that were outside of the range were at least in the the same order of magnitude.

However, if the viscosity of each of these solvents was understood to be measured in any other units, as suggested as possible by the Examiner, the resultant value of viscosity would be drastically changed and would no longer agree with the claims or the specification. In other words, if the viscosities of methyl acetate, methyl proprionate, and diethyl carbonate were to be measured in units of Poises and Pascal-seconds, as suggested by the Examiner, the viscosities of these solvents would be 0.0037 P and .00037 Pa-s, .0043 P and .00043 Pa-s, and .0075 P and .00075 Pa-s, respectively, each of which is several orders of magnitude less than the values being claimed. In contrast, the solvents outside the range, as discussed above, are now within

the claimed range due to the application of the unit conversion suggested by the Examiner.

Furthermore, applicants also note that an article from the online encyclopedia reference.com is being submitted concurrently herewith as Appendix A to provide further evidence that cP's would have been the units understood to be the units of measurement of viscosity in this application. As shown in the article, the physical unit for dynamic viscosity "is more commonly expressed, *particularly in ASTM standards* (emphasis added), as *centipoises* (cP)." This article is consistent with the declaration explaining Exhibit A attached to the January 18, 2005 Response, which noted that the appropriate unit of measurement of viscosity in the art is the cP.

Here, applicants understand that despite the evidence being submitted and the remarks above, the statement in the article may be parsed so as to support the idea that the units of viscosity could have been something other than cP's. However, applicants assert that this is not a reasonable interpretation of the article since the article specifically points out that the ASTM standards point to the use of cP's as appropriate units. Applicants submit that this fact, along with the remarks above, combine to show that cP's were understood to be the units of measurement of viscosity in this application.

In addition, the Examiner also reiterated the allegation that solvent concentrations of 30% and 70% were not disclosed by the original application. This, despite the fact that concentrations of 30% and 70% were clearly within the originally claimed invention as well as the original disclosure and despite the fact that applicants requested that attention be returned to the declaration filed October 2, 2003 in which solvent concentrations were clearly shown to be understood as part of the application at the time of the invention. From the remarks, which do not address the section of the declaration dealing with these concentrations (i.e., Table 1 of the October 2, 2003 declaration), it appears as though the evidence presented has been either ignored or dismissed summarily. In both cases, applicants submit that it is incumbent upon the Examiner to review the declaration carefully and, if a legitimate disagreement exists as to the merits of the evidence presented therein, to provide a clear explanation of that disagreement. Specifically, the Examiner must explain how one would conclude that rnage points of 30% and 70% were not disclosed in the original disclosure even though concentration ranges of 20-40% and 60-80% were disclosed. Further, the Examiner must point out why the 70/30 ratio disclosed by the Table 1 of the declaration does not provide the evidence of such disclosure.

REJECTION UNDER 35 U.S.C. §112, FIRST PARAGRAPH:

In the Office Action, claims 2-3, 4, 8-9, 29-30, 10, 32-35, 11, 12-13, 14-17 and 36-40

were rejected under 35 U.S.C. §112, first paragraph, as failing to comply with the written description requirement. These rejections are traversed and overcome for substantially the same reasons as set forth previously and in the remarks hereinabove. Thus, applicants assert that the rejections of claims 2-3, 4, 8-9, 29-30, 10, 32-35, 11, 12-13, 14-17 and 36-40 are overcome.

CONCLUSION:

There being no further outstanding objections or rejections, it is submitted that the application is in condition for allowance. An early action to that effect is courteously solicited.

Finally, if there are any formal matters remaining after this response, the Examiner is requested to telephone the undersigned to attend to these matters.

If there are any additional fees associated with filing of this Amendment, please charge the same to our Deposit Account No. 503333.

Respectfully submitted,

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Date: ___12/ 1/05___   By: _____

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EXHIBIT A

Viscosity

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Viscosity

Viscosity is a measure of the resistance of a fluid to deformation under shear stress. It is commonly perceived as "thickness", or resistance to pouring. Viscosity describes a fluid's internal resistance to flow and may be thought of as a measure of fluid friction. Thus, water is "thin", having a low viscosity, while vegetable oil is "thick" having a high viscosity.

Newton's theory

When a shear stress is applied to a solid body, the body deforms until the deformation results in an opposing force to balance that applied, an equilibrium. However, when a shear stress is applied to a fluid, such as a wind blowing over the surface of the ocean, the fluid flows, and continues to flow while the stress is applied. When the stress is removed, in general, the flow decays due to internal dissipation of energy. The "thicker" the fluid, the greater its resistance to shear stress and the more rapid the decay of its flow.

In general, in any flow, layers move at different velocities and the fluid's "thickness" arises from the shear stress between the layers that ultimately opposes any applied force.

Isaac Newton postulated that, for straight, parallel and uniform flow, the shear stress, τ, between layers is proportional to the velocity gradient, $\partial u/\partial y$, in the direction perpendicular to the layers, in other words, the relative motion of the layers.

$$\tau = \mu \frac{\partial u}{\partial y}.$$

Here, the constant μ is known as the *coefficient of viscosity*, *viscosity*, or *dynamic viscosity*. Many fluids, such as water and most gases, satisfy Newton's criterion and are known as Newtonian fluids. Non-Newtonian fluids exhibit a more complicated relationship between shear stress and velocity gradient than simple linearity.

In many situations, we are concerned with the ratio of the viscous force to the inertial force, the latter characterised by the fluid density ρ. This ratio is characterised by the *kinematic viscosity*, defined as follows:

nu = frac {mu} {rho}.

James Clerk Maxwell called viscosity *fugitive elasticity* because of the analogy that elastic deformation opposes shear stress in solids, while in viscous fluids, shear stress is opposed by *rate* of deformation.

Viscosity is the principal means by which energy is dissipated in fluid motion, typically as heat.

Measurement of viscosity

Viscosity is measured with various types of viscometer, typically at 25°C (standard state).

Units

Viscosity (dynamic viscosity)

The SI physical unit of dynamic viscosity is the pascal-second (Pa·s), which is identical to $1 N·s/m^2$ or 1 kg/(m·s). In France there have been some attempts to establish the *poiseuille* (Pl) as a name for the Pa·s but without international success. Care must be taken in not confusing the poiseuille with the poise named after the same person!

The cgs physical unit for dynamic viscosity is the *poise* (P) named after Jean Louis Marie Poiseuille. It is more commonly expressed, particularly in ASTM standards, as *centipoise* (cP). The centipoise is commonly used because water has a viscosity of 1.0 cP (at 20 °C).

1 poise = 100 centipoise = 1 g/(cm·s) = 0.1 Pa·s.

Kinematic viscosity

The SI physical unit of kinematic viscosity is the (m^2/s). The cgs physical unit for kinematic viscosity is the *stokes* (abbreviated S or St), named after George Gabriel Stokes . It is sometimes expressed in terms of *centistokes* (cS or cSt). In U.S. usage, *stoke* is sometimes used as the singular form.

1 stokes = 100 centistokes = $1 cm^2/s$ = $0.0001 m^2/s$.

Molecular origins

The viscosity of a system is determined by how molecules constituting the system interact. There are no simple but correct expressions for the viscosity

of a fluid. The simplest exact expressions are the Green-Kubo relations for the linear shear viscosity or the Transient Time Correlation Function expressions derived by Evans and Morriss in 1985. Although these expressions are each exact in order to calculate the viscosity of a dense fluid, using these relations requires the use of molecular dynamics computer simulation.

Gases

Viscosity in gases arises principally from the molecular diffusion that transports momentum between layers of flow. The kinetic theory of gases allows accurate prediction of the behaviour of gaseous viscosity, in particular that, within the regime where the theory is applicable:

- Viscosity is independent of pressure; and
- Viscosity increases as temperature increases.

Liquids

In liquids, the additional forces between molecules become important. This leads to an additional contribution to the shear stress though the exact mechanics of this are still controversial. Thus, in liquids:

- Viscosity is independent of pressure (except at very high pressure); and
- Viscosity tends to fall as temperature increases. See temperature dependence of liquid viscosity

The dynamic viscosities of liquids are typically several orders of magnitude higher than dynamic viscosities of gases.

Viscosity of some common materials

Some dynamic viscosities of Newtonian fluids are listed below:

Gases (at 0 °C): :

	viscosity (Pa·s)
hydrogen	8.4×10^{-6}
air	17.4×10^{-6}
xenon	21.2×10^{-6}

Liquids (at 20 °C): :

	viscosity (Pa·s)
ethyl alcohol	0.248×10^{-3}
acetone	0.326×10^{-3}
methanol	0.59×10^{-3}

benzene	0.64×10^{-3}
water	1.025×10^{-3}
nitrobenzene	2.0×10^{-3}
mercury	17.0×10^{-3}
sulfuric acid	30×10^{-3}
olive oil	81×10^{-3}
castor oil	0.985
glycerol	1.485
pitch	10^7

Many fluids such as honey have a wide range of viscosities.

Can solids have a viscosity?

It is commonly asserted that amorphous solids, such as glass, have viscosity, arguing on the basis that all solids *flow*, to some possibly minuscule extent, in response to shear stress. Advocates of such a view hold that the distinction between solids and liquids is unclear and that solids are simply liquids with a very high viscosity, typically greater than 10^{12} Pa·s. This position is often adopted by supporters of the widely held urban myth that glass flow can be observed in old buildings.

However, others argue that solids are, in general, elastic for small stresses while fluids are not. Even if solids flow at higher stresses, they are characterized by their low-stress behavior. Viscosity may be an appropriate characteristic for solids in a plastic regime. The situation becomes somewhat confused as the term *viscosity* is sometimes used for solid materials, for example Maxwell materials, to describe the relationship between stress and the rate of change of strain, rather than rate of shear.

These distinctions may be largely resolved by considering the constitutive equations of the material in question, which take into account both its viscous and elastic behaviors. Materials for which both their viscosity and their elasticity are important in a particular range of deformation and deformation rate are called *viscoelastic*. In geology, earth materials that exhibit viscous deformation at least three times greater than their elastic deformation are sometimes called rheids.

One example of solids flowing which has been observed since 1930 is the Pitch drop experiment.

Eddy viscosity

In the study of turbulence in fluids, a common practical strategy for

calculation is to ignore the small-scale *vortices* (or *eddies*) in the motion and to calculate a large-scale motion with an *eddy viscosity* that characterizes the transport and dissipation of <u>energy</u> in the smaller-scale flow. Typical values of eddy viscosity used in modeling <u>ocean</u> circulation are in excess of 10^7 Pa·s.

Fluidity

The reciprocal of viscosity is *fluidity*, usually symbolised by φ (=$1/\mu$), measured in *reciprocal poise* (<u>cm·s/g</u>), sometimes called the *rhe*. *Fluidity* is seldom used in <u>engineering</u> practice.

Etymology

The word "viscosity" derives from the Latin word "viscum" for <u>mistletoe</u>. From the mistletoe berries a viscous glue has been made and used for lime-twigs to catch birds.

See also

- <u>Thixotropy</u>
- <u>Dilatant</u>

Bibliography

- Massey, B S (1983) *Mechanics of Fluids*, fifth edition, ISBN 0442305524

Download free Viscosity- und Rheology E-book in English and German (warning: <u>PDF</u> files):

- *<u>Introduction to Rheology by Gebhard Schramm in English language</u>*
- *<u>Einführung in die Rheologie von Gebhard Schramm in deutscher Sprache</u>*

- **Viscosity** is also an out-of-print image and animation editing utility published by <u>Sonic Foundry</u>. It can work with <u>PNG</u>, <u>GIF</u>, <u>JPG/JPEG</u>, <u>BMP</u>, <u>AVI</u> and its native VSC format.